Remarks

This is in response to the Office Action dated September 27, 2004. The Office Action first objected to the specification stating that the example on page 12-15 in the application as filed did not read on Table 1 on page 12 or on Table 3 on page 15. The Office Action also rejected claims 1-5 under 35 U.S.C. §101 as being directed to nonstatutory subject matter. The Office Action also rejected claims 1, 3 and 5 under 35 U.S.C. §103(a) as being obvious over the document "Wide Area Network Design" by Robert S. Cahn ("Cahn"). Finally, the Office Action rejected claims 2 and 4 under 35 U.S.C. §103(a) as being obvious over Cahn in view of "Multiprotocol Label Switching: Enhancing Routing in The New Public Network" by Juniper Networks ("Juniper").

Claims 1, 3 and 5 have been amended and new claim 6 has been added. Claims 1-6 remain under consideration.

I. Specification

The Office Action first objected to the specification stating that the example on page 12-15, stating that:

"[t]he example [page 12-15] disclosed by applicant in the originally filed application on 07 November 2000 does not read upon Table 1 [page 12], rates used in line 1 of page 14, Table 3 [page 15]."

The precise objection or rejection intended by the Office is not clear from this sentence. Applicant is uncertain whether the Office is objecting to the portions of the specification describing Tables 1 and/or 3; whether the Office intended to object to rates listed on line 1 of page 14; whether the Office intended to object to Tables 1 and 3 themselves; or whether the Office intended some other objection. Applicant addresses each of these possible rejections. Applicant respectfully traverses. If the Office intended some other objection or rejection, applicant respectfully requests that the Office point out and describe with particularity the intended objection or rejection.

A. Table 1 and Associated Description: The specification and drawings clearly describe Table 1 on page 12. The paragraph at page 7, lines 6-19 clearly describes

network nodes A, B, C, D, E, F and G, as shown in Figure 1. As is also clearly described in that paragraph, each of these nodes illustratively has an ingress flow rate (I) and an egress flow rate (O). As is further stated at page 7, lines 16-17,

> "[t]able 1 gives ingress flow rate capacity I and an egress flow rate capacity O for the network nodes labeled A, B, C, D, E, F, and G. Table 2 gives the data transfer cost for each of the possible communications paths between network nodes A, B, C, D, E, F, and G."

Thus, as is clearly described, Table 1 shows ingress and egress rates for each of the above-referenced network nodes. This is clearly described by the specification. Applicants respectfully request the withdrawal of the objection associated with Table 1 or the associated description.

B. Table 3 and the Associated Description: In the illustrative example beginning on page 12, an ingress and egress flow rate is assigned to each node in a data network. As discussed above, these rates are shown in Table 1 and described in the specification. As described at page 12, lines 4-6, Table 2 shows costs for transferring 1 kilo bit of data traffic in one second between the nods in a VPN. To calculate a cost for a particular path through the network, the digital computer program creates a graph depicted in Figure 2(a), which shows a start node and a finish node. In this illustrative example, as described on page 13, lines 4-5, node E is the start node and node D is the finish node. Also described on page 13, lines 5-6, in this illustrative example, the digital computer program assigns a 10 kbps traffic flow from the start node to the end node. Referring to Table 2, the cost from node D to node E is illustratively \$2.00 per kbps. Since the computer program is assigning a 10 kbps flow to the illustrative path, the cost L' is defined by the equation at page 13, lines 7-8 of :

$$L' = (\$2.00/\text{kbps}) \times 10\text{kbps} = \$20.00$$

Such costs are calculated for every path possible between two points in the illustrative graph of Figure 1 by repeated iterations of the above calculation using the different rates as shown in Table 2 on page 13. This method is described in the steps beginning at page 11, line 4.

As described at page 14, lines 18-20, Table 3 shows the results of these iterations by listing the iteration number, the number of nodes in the graph created by the digital computer, the flow rate, the cost L' calculated by the digital computer and described above and, finally, the cumulative cost L that is obtained by adding the individual values for L'. All of this is clearly described by the description beginning at page 11, line 2 through the end of page 15.

Page 14, line 1 Values: A typographical error was made in Table 2. Specifically, the cost shown by the intersection of F and D in that table should read "$3.50" not "2.50". A replacement table has been provided showing the changes to Table 2 to correct this typographical error. Thus, the value "$3.50" referenced on page 14, line 1 is now in conformance with Table 2. The cost of the path from nodes D to E of $2.00, as is also referenced on page 14, line 1, was calculated above by the equation for L' and, for reasons stated above, is adequately supported by the specification.

For the foregoing reasons, as amended the specification supports Tables 1 and 3 in the example discussed at pages 11-15 in the present application. Applicant respectfully requests withdrawal of the objection to the specification.

Rejection: 35 U.S.C. §101

The Office Action rejected claims 1-5 under 35 U.S.C. §101 as being directed to nonstatutory subject matter. Applicants traverse.

Applicant refers to the "Examination Guidelines for Computer-Related Inventions, Final Version" issued by the Patent and Trademark Office published on February 28, 1996 in the Federal Register at 61 Fed. Reg. 7478. Applicant particularly notes Section IV(B)(2)(c) of the Guidelines, which states

> "[W]hen a claim reciting a mathematical algorithm is found to define non-statutory subject matter the basis of the § 101 rejection must be that, when taken as a whole, the claim recites a law of nature, a natural phenomenon, or an abstract idea."

The Office Action rejects claims 1-5 as being abstract ideas. Section IV(B)(2)(e) of the Guidelines addresses treatment of rejections of claims based on such abstract ideas. Specifically, this section states that:

> "Office personnel must analyze the claim as a whole, in light of the specification, to understand what subject matter is being manipulated and how it is being manipulated. During this procedure, Office personnel must evaluate any statements of intended use or field of use, any data gathering step and any post-manipulation activity. *Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under § 101.*" (emphasis added)

Thus, a rejection under 35 U.S.C. §101 is proper in such circumstances only if, in light of the specification, a claim is devoid of any limitation to a practical application in the technological arts.

Using this test, in light of the specification, the present invention as claimed is not devoid of any limitation to a practical application. Indeed, as is stated in the present application at page 6, lines 18-20:

> "The invention is a computer method for approximating the total cost of the network bandwidth services on a Virtual Private Network (VPN) that employs Multi-Protocol Label Switching (MPLS) technology."

As further disclosed in the specification at pages 1-3, when dedicated hardware is used to deliver telecommunications services, it is relatively easy to determine the cost of the infrastructure necessary to deliver such services and, in turn, to bill the customer an appropriate amount for such services. However, in VPNs that are not permanent, the provider must price a service accurately, even though many times the destination of traffic entering the VPN is unknown. Since such a VPN is based on virtual links and not strictly on hardware links, calculating such costs becomes difficult. Thus, as stated in the background at page 3, lines 21-23:

> "[t]he problem to solve is to develop a way to establish a price for the bandwidth that each VPN customer uses, knowing only the access rates, not the destination of the traffic."

Applicant has amended claims 1, 3 and 5 to more particularly point out and distinctly claim the present invention. Specifically, applicant has amended each of those claims to specify that the steps of those claims are specifically applicable to calculating the cost of "bandwidth used across a network connection between a first network node

and a second network node in an MPLS-based VPN." Support for this limitation can be found on page 13, which discusses the need to establish a price for bandwidth that each VPN customer uses (lines 21-23) across a virtual circuit/connection (lines 10-12).

Thus, a solution to the intractable problem of calculating costs in an MPLS-based VPN would advance the technological art of providing services such a network. Throughout the specification, embodiments of the invention are described wherein costs (expressed in dollars) of transmitting data, expressed in kilobits per second (kbps), are determined when that data is transmitted from or through one or more network nodes. Transmitting data from one network node to another is not an abstract idea and is certainly within the technological arts. Calculating or estimating a bandwidth cost of transmitting data between such nodes, which is the practical implementation of the invention as claimed, is likewise not an abstract idea. As one skilled in the art will recognize, such bandwidth costs are crucial to determining rates to charge customers for various services and to determine whether using various paths between nodes is cost effective.

Accordingly, for the foregoing reasons, the steps of the claimed invention, as amended, are directed to a well-understood practical implementation when interpreted in light of the specification as a whole. It follows that claims 1-5 are directed to statutory subject matter Applicant respectfully requests, therefore, that this rejection be withdrawn.

Rejection: 35 U.S.C. §103(a) – Cahn

The Office Action also rejected claims 1, 3 and 5 under 35 U.S.C. §103(a) as being obvious over Cahn. Applicants traverse.

In order for an invention to be obvious under 35 U.S.C. §103(a), there must be some suggestion within cited prior art references to combine or modify those references in a manner which would show or suggest all elements of the claimed invention. When a single prior art reference is relied upon for an obviousness rejection, there must be some suggestion within that single reference to modify the teachings of the single reference in a way that would render the claims obvious. For the reasons discussed below, the Office Action fails to show that Cahn teaches all elements of claims 1, 3 and/or 5.

The Office Action cites pages 64-72 of Cahn as teaching "a greatest lower bound for the bandwidth" and a least upper bound for the bandwidth" used in an MPLS-based

VPN. This section of Cahn discloses Minimum Spanning Trees (MSTs) (beginning on page 64) and various topics related to such MSTs, such as determining an average hop count in an MST and the resulting determination that, for a large number of nodes, traffic volume increases dramatically relative to a small number of nodes. Accordingly, MSTs are not cost effective tools in networks with a large number of nodes. Thus, other types of trees for use in network design are disclosed. One such type of tree that is discussed as an alternative to MSTs is the Shortest Path Tree (SPT) beginning on page 66. A method of using such trees is also disclosed beginning on page 67 as is computer code to implement the method. The conclusion is made that such SPTs are not particularly good networks since a star-like network map typically results. However, as discussed at page 69, when compared to MSTs, link utilization is typically lower. Additionally, as discussed beginning on page 70, the Cahn reference compares packet delay over an MST network with the packet delay for the SPT star-like network. The conclusion is reached that SPT star networks have a lower cost than an MST network. On page 71, the term "bounded" appears. However, this term is used to refer to the average packet delay of a 100 node MST network and a 100 node SPT network.

Finally, on pages 71-72, different algorithms for constructing network trees, either SPT or MST, are disclosed. Specifically, this portion of Cahn teaches that Prim's algorithm and Dijkstra's algorithms have advantages and disadvantages, specifically, Prim's algorithm minimizes the cost of network links by selecting short links for each hop, thus creating circuitous routing maps. Such circuitous maps often result in excessively large paths through a network. On the other hand this passage also teaches that Dijkstra's algorithm produces nodes where most traffic transits via a central node. This produces shorter paths, but may also result in more expensive networks.

Since it is desirable in many implementations to minimize both cost of a network and path lengths through the network, Cahn at pages 71-72 teaches to use both Prim and Dijjkstra algorithms together at each node in the network. A weighted formula is presented whereby a weighting factor α is applied to the calculations performed by at least one of the algorithms. The value of this weighting factor is directly related to both the average number of hops and link delay experienced by packets. The result is that a range of calculations is obtained for the overall cost of a network can be compared to the link delay experienced by the network.

Contrary to the assertions of the Office Action, at no point in the cited portion of Cahn does that reference teach the claimed elements of "computing a greatest lower bound for bandwidth", "computing a least upper bound for the bandwidth" or of "combining the upper bound and the lower bound to produce an estimate of the cost of the bandwidth." The only range of any kind that is disclosed, and which may possibly be considered to have an upper and a lower boundary, is the aforementioned weighting factor. However, a weighting factor for weighting calculations by two different algorithms is not the same the claimed upper bound for the bandwidth and lower bound for the bandwidth. No teaching of combining any bounds is taught by the cited passage.

The Office Action admits that "Cahn does not explicitly combine the upper bound and the lower bound to produce (calculate) an estimate for the cost of the bandwidth." However, the Office Action states that "Cahn combines the Star and MST to calculate costs." As discussed above, however, combining the Prim and Dijkstra calculations by using labels that correspond to a Star or MST network design and providing a weighting factor to weight those calculations in different ways is not the same as the claimed invention.

Therefore, for the foregoing reasons, none of the elements of claims 1, 3 or 5 are taught by the Cahn reference and there is no suggestion within Cahn to modify the teachings of Cahn to teach the invention as claimed in those claims. Accordingly, none of claims 1, 3 or 5 are obvious over the Cahn reference. As a result, claims 1, 3 and 5 are allowable over that reference. It follows that claims 2 and 4 are allowable as being dependent upon an allowable base claim.

<u>Rejection: 35 U.S.C. §103(a) – Cahn in view of Juniper</u>

The Office Action rejected claims 2 and 4 under 35 U.S.C. §103(a) as being obvious over Cahn in view of Juniper. Once again, in order for an invention to be obvious under 35 U.S.C. §103(a), there must be some suggestion within cited prior art references to combine or modify those references in a manner which would show or suggest all elements of the claimed invention. As discussed above, Cahn does not teach that which it is asserted as teaching and, as a result, claims 2 and 4 are allowable for the reasons stated above.

In rejecting claims 2 and 4, the Office Action relies on the "Class of Service (CoS)" discussed in Juniper as teaching the claimed element of "wherein the step of computing a least upper bound includes a cut constraint". Applicant disagrees. While Juniper does discuss CoS, it does so only in discusses using such CoS's in determining appropriate queuing for transmissions based on the precedence assigned to the respective classes of service. The Juniper teaches that such CoS's are advantageous because they provide flexibility in the different types of services provided to customers. The CoS precedence (e.g., as indicated by precedence bits in a header) are used to determine the specific type of service that is supported by each service classification.

This is much different than the cut constraints as claimed in claims 2 and 4. In particular, as taught at pages 21-22 of the present application, cut constraints are used in international implementations of MPLS networks to offer cost effective multi-national MPLS-based networks to prevent a flow between two sets of nodes to exceed a cost limit. This flow constraint is used to compute an upper bound as claimed for each side of cut. This is not the same as Classes of Service as taught by Juniper.

Therefore, for the foregoing reasons, "cut constraints" as claimed by claims 2 and 4 are not taught by the Cahn or Juniper references and there is no suggestion within those references to modify the teachings of either Cahn or Juniper to teach the invention as claimed in those claims. Accordingly, claims 2 and 4 are not obvious over the Cahn and Juniper references. As a result, claims 2 and 4 are allowable for this additional reason

New Claims:

New claim 6 has been added to claim a network computer in accordance with the principles of the present invention. No new matter has been introduced as a result of the addition of this new claim. Support for this claim can be found at least at page 6, line 17 through page 7, line 5 of the specification as filed. This claim is allowable over the rejections and objections cited by the examiner for the reasons stated above in association with the rejections of claims 1-5.

Conclusion:

For the foregoing reasons, the Office Action has failed to show that each and every element of claims 1-6 of the present application are taught or suggested by Cahn or

Juniper, either alone or in combination. Therefore, claims 1-6 are not rendered obvious under those references. As a result, claims 1-6 are allowable.

Therefore, applicant requests allowance of all claims.

Respectfully submitted,

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